ICT enabled teacher training for Human Capital formation: A study of IIT Bombay initiative

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Abstract

Information and communication technologies (ICT) have become a major factor in shaping the new global economy and thereby producing rapid process of changes in the society. Many developed and developing countries are using ICT enabled education as a tool for quality education and to fill the gap between traditional methods and new methods of teaching and learning. Research shows that ICT enabled education has a positive impact on teachers and learners. This paper is based on analysis of the data drawn from a questionnaire survey of the people who participated in the teacher training programme through distance mode, conducted by IIT Bombay. In this initiative IIT Bombay has used satellite (EDUSAT) technology and Internet technology to train a large number of college teachers spread across the country through the distance mode. Specifically, around six hundred and forty college teachers in the area of computer programming were trained through distance mode under the National mission on education through ICT. The analysis of the responses given by the participants of the course suggests that ICT enabled training provides greater exposure and better knowledge to teachers in engineering colleges located in less developed regions of India.

Keywords: ICT enabled education, Synchronous distance education, Teacher training.

1 Introduction

The relationship between economic growth and education has been one of the central threads of economic analysis. Both *Adam Smith* in eighteenth century and *Alfred Marshall* in the nineteenth century showed how individual investment in education influences the economy of the nation. Most studies find evidence of higher gross domestic product (GDP) growth in countries where the population has completed more years of schooling and attained required skills to contribute towards nations' growth. According to Sen (1999, Chapter 2) one cannot achieve sustainable growth when a large number of people are illiterate. On an average, countries that have higher levels of literacy and have invested steadily in raising the education levels of their labour force have sustained higher levels of economic growth, for example, South Korea, United States of America, Japan and Germany to name a few (Agarwal, 2006). Therefore, education is essential for growth and development of a nation.

Education has evolved over the years from the basic reading, writing and arithmetic, to present day globalized view, which stresses on group work, lateral thinking, creativity, problem solving and innovation (Beyers, 2009). Historically, education was largely funded by government/public funds at a subsidized rate. The publically funded education system helped many societies to get education at an affordable cost. Today, globally the cost of education has gone up many fold. Due to high demand for education, many private institutions have come up. This shift has made education a 'market good' from a 'public good'. As a result, the cost of education has become very high and is beyond the reach of a large section of the society.

The education system faces many new challenges. Some of the challenges are: 1. Expanding the reach of education. 2. Imparting quality education at affordable costs. 3. Shortage of qualified and experienced faculty. A quick way to address these challenges, at least partially, is to use technologies. The traditional solution in education will not suffice to meet these challenges, especially in the context of today's knowledge intensive societies. We need a new approach to address these challenges. Implementation and integration of information and communication technologies (ICT) into education system is expected to address some of these challenges.

ICT is often associated with sophisticated technologies. But ICT also includes the conventional technologies, such as, radio, television and telephone. In today's networked society, the technology used is often blended - we use multiple technologies simultaneously. We use satellite, Internet and video conferencing facilities to connect with people who may be across different geographical locations (Reddi, 2004). Through the application of ICT, one can diminish the impact of space, time and distance.

In the last two decades, many institutions around the world have adopted ICT enabled education to close the gap between old and new models of teaching/learning. ICT gives rise to new digital skills and competence that are needed for employment, education and training, self-development and participation in the society. ICT plays a key role to optimally utilize the human capital and potential in the society. Therefore, teacher training using ICT is crucial, because ICT are tools that on one hand can facilitate teacher training and on other hand help them to take full advantage of potential of technology to enhance student learning (UNESCO, 2003).

Indian Institute of Technology, Bombay (IIT Bombay), is involved in a number of initiatives that uses ICT to improve the quality of technical education in the country. Since 2002, IIT Bombay has been involved in both synchronous and asynchronous distance engineering education programme (Moudgalya, Phatak and Shevgaonkar, 2008). Currently, there are about seventy (70) EDUSAT centres of Indian Space Research Organization (ISRO) across the country connected to the IIT Bombay network. The proposal on training and engaging a very large number of teachers using EDUSAT to enhance the effectiveness of teaching/learning process was accepted under the National mission on education through ICT, Ministry of Human Resource and Development (MHRD). This initiative envisages a collaborative development of digital teaching/learning material incorporating specific needs of teachers and students as per the syllabi and examination pattern followed at different colleges and universities. This will ensure that the contents are meaningful for each locale, and are thus likely to be adopted for actual use. The contents are being released in open source under 'Creative Commons India' license (Creative-Commons, 2010), which would encourage actual adoption of these contents and of the teaching methodology developed in each subject. Additionally, a teaching/learning portal is being developed which will further encourage millions of our students to remain

engaged and benefit on a continued basis. We believe that such initiatives would thus have a significant impact on the quality of engineering education in the country on a very large scale.

The key assertion of this paper is that effective use of ICT for teacher training can scale up the training activity significantly in the country and help in human capital formation. This paper begins with a discussion on the concept and methodology involved in training a large number of teachers in a distance mode and examines the usefulness or impact of such initiatives on the teaching communities in India.

There are several initiatives undertaken by the government, both at the centre and at the state to facilitate skill upgradation of teachers in technical institutions. We are taking up the case of one such initiative, undertaken by IIT Bombay for this study. Based on the feedback received from the participants of the specific programme under consideration, we are examining the perception of the teachers in the usefulness of the training received.

This paper is organized as follows: Section 2 provides a review of literature of studies that have examined the usefulness of ICT tools to impart education. Section 3 gives a brief overview of the state of higher education in India. In section 4 the background, scope and training methodology used in the ICT enabled teacher training programme carried out in IIT Bombay is given. While section 5 gives the data, methodology used and analysis, summary and conclusion are given in section 6.

2 Literature review

The cost of higher education is rapidly increasing across the world. In future, financing higher education is going to be the major concern, especially for developing countries. As most of the population in the developing countries cannot afford high cost of higher education, the cost of education has to be kept low. The low cost of education can be achieved through online, web-based and distance education. Currently, most online education is happening in the developed countries, such as USA, Canada, United Kingdom and Australia. In the developed countries technological innovation and ICT developments are embedded in the existing infrastructure, therefore, there is greater degree of acceptance among the users, whereas, in developing countries a societal history in the technology and industrial innovation is missing. Hence, it becomes difficult to implement

technology based education, but as the productive population in developing countries is increasing at a faster pace, many predict that future online education will occur more from the developing countries (Bunt-Kokhuis, 2001).

Many universities across the world are imparting distance education to cater to a large number of people. During the early stages, these universities used the conventional approach. The learning material used were mainly written material in the form of notes and text books. Now, many universities have adopted ICT tools to impart education.

Based on the studies done in Oman, Sridhar (2005), presents the role of e-governance in higher education especially in incorporating ICT technologies. In the 6th five year plan, Oman government gave first priority to raise the enrollment ratio in higher education and in upgrading and spreading basic education. e-learning in higher education became a national level policy and the government invested large scale infrastructural resources and institutions provided sophisticated learning environment with digital access for a range of specialization. According to the author, the e-learning programme is helping many women, who could not participate earlier because of cultural barriers.

Many American universities have web-based courses in higher education. Some of the well known programmes are: MIT Open Courseware (OCW, 2010) and Connexions (Connexions, 2010). Both the programmes provide free and open source contents through the dedicated portals.

International Monetary Fund and World Bank have helped incorporate western educational content in South Africa and Namibia. Some researchers have found that high dropout rate, alienation and unemployment in Africa are partly due to the implementation of western based curricula, which does not take into consideration the African culture, languages, customs and values (Bunt-Kokhuis, 2001).

In India, Indira Gandhi National Open University (IGNOU, 2010) has adopted various ICT tools, such as radio, television (TV), compact discs (CDs) and web-based content to cater to more than two million students in over one thousand five hundred study centres. *Gyan Vani* was opened in 2002 to broadcast educational content through radio. According to Agrawal (2005), Indian learners prefer TV to radio. Now, *Gyan Darshan* provides twenty four hours educational broadcast on TV. A survey conducted had indicated a positive response for *Gyan Darshan*, however, it was also found that dropout rate

in distance education was high. The most common reasons for high dropout rate were found to be unmanageable distance from the students' residence to the nearest study centre, lack of academic support and interaction with fellow students (Berman, 2008).

The Sri Lankan government is spending money to strengthen the public school system and several ICT enabled project at the university level. Bachelor of information technology at the university of Colombo and open university of Sri Lanka use a broad range of distance education approaches. A major ten year project devoted to the distance education modernization was launched in 1999. The outcome has not yet been clearly evaluated (Berman, 2008).

In Bhutan, the Royal University of Bhutan (RUB) has about four thousand students. It uses distance education mainly for Distance Teacher Education Programme (DTEP). In 2003, to improve the accessibility for students located in remote areas of Bhutan they shifted from the traditional educational media to web-based learning management system. It was found that because introduction of e-learning was premature in Bhutan, people were not ready for the technology based education (Berman, 2008).

In China, the Global Development Learning Network (GDLN) centre was established in Beijing in 2000. In 2007, China Western Development Distance Learning Network (CWDDLN, 2010) entered into a memorandum of understanding with the World Bank. Initially, one management hub was established in Beijing and eleven distance learning centres were established in the poorer western province of China. In phase-II about fifty distance learning centers have come up across China. The distance education programme is very successful in China.

It is apparent from these studies that in future most developing countries will adopt ICT enabled distance education to improve the Gross Enrollment Ratio (GER) in higher education and to keep the cost of education low. The key issues in implementation are: technology acceptance, content development and dissemination. While developing the contents it is essential to take into consideration the curricula, local language and culture.

Recent literature on technology in education shows that there are many technology resources that are available to today's teachers and students. However, how each is used and the extent of use by teachers and students varies dramatically. Various technology

innovations in education is an important reminder that developing a new form or process does not guarantee that it will be widely used.

According to Hall (2010) many promising technologies are widely available but the main weakness is the lack of understanding about what is involved in helping teachers to fully implement and integrate their use. The continuing challenge with technology innovations is to move beyond early adoption to widespread use. Hall's Concerns Based Adoption Model (CBAM) consists of three research based dimensions- stages of concern, level of use and innovation configurations and a component analyzing change facilitator styles. These constructs can serve as diagnostic tools to help document current levels of implementation and inform strategies for going forward across what Hall refers to as an implementation bridge. Implementation is a key focus to Hall's work and he attributes most disappointing outcomes with technology to under appreciating the challenges of implementation.

Studies by Ertmer and Ottenbreit-Leftwich (2010) complement Hall's model for studying implementation in addressing key variables for effective technology change. They found that most schools do not use technology in an effective way. Even when the technology is used it is not used to support instructions that facilitate student learning. According to the authors, in order to achieve the kind of technology uses required for the 21st century teaching and learning, we need to help teachers understand how to use technology to facilitate meaningful learning, that will enable students to construct their own knowledge. Based on technology's potential to engage students in active learning and enable teachers to differentiate instruction, the authors assert that a new definition of good teaching should include the use of appropriate learning technologies as meaningful pedagogical tools. The authors recommend four key areas pertaining to teacher change: knowledge, self-efficacy, pedagogical beliefs and school culture. The authors cite technological pedagogical content knowledge (TPCK) as helpful framework for teachers and educators to consider for technology use.

From the literature it is clear that though ICT enabled education is seen as a way to improve the quality of education in many countries, its implementation is complex. One has to take into consideration many factors, such as availability of technology, time, training and support, coordination and management, individual attitude, belief and mo-

tivation, characteristics and ethos of the organization (Tearle, 2004). It also costs a lot of money to build the ICT infrastructure and to maintain them. Technology obsolescence is another challenge. ICT enabled education requires different pedagogy from the traditional way of teaching and learning. Teachers who are used to the traditional way of teaching might find it difficult to re-orient themselves in the new ICT framework. For example, it is not easy to convert a good teacher into a good online teacher. Although many problems of developing world, such as poverty, illiteracy and inequality can be addressed with the help of ICT enabled education, it is found that most developing countries do not have the necessary ICT infrastructure for the implementation. Many developing countries cannot afford the high cost to build ICT infrastructure and maintain them. As a result, very few people in the developing countries have access to ICT and therefore cannot reap the benefits.

Despite the challenges, many developed and developing countries have adopted national polices to stimulate ICT enabled education. ICT enabled education has the potential to impact quality education to all, at a very low cost. As ICT awareness in the society is growing, more and more people can adopt, use and participate in ICT enabled education. Thus, it has the potential to be inclusive. It is predicted that in future many virtual universities will emerge.

3 A brief note on the state of higher education in India

Higher education trains people to take up different economic roles in the society and spurs technological innovation that drives economic growth. It is important that the country's capacity in higher education is aligned to the demand for skills from the economy, which would include the demand for teachers from the education system itself. Since higher education itself cannot create jobs, a mismatch between the demand and the supply of quality and number of graduates would lead to unemployed graduates and / or a shortage of graduates with certain kind of skills.

According to Agarwal (2006), the emergence of a global economy due to increased trade, investment and mobility of people, and more recently work across borders, has forced nation states to adapt their systems of higher education to the changed global

realities. Rather than continuing with their inward looking policies, several countries are reshaping their systems of higher education for making them globally competitive. The United States of America (USA) continues to invest large amounts in higher education. The United Kingdom (UK) has injected new dynamism in the higher education sector through competition and incentives. China has undertaken a package of comprehensive reforms in higher education for over the past two decades. The government in China has declared education, science and technology to be the strategic driving forces of sustainable economic growth.

An analysis of enrollment in higher education across nations suggests that there is broadly a positive correlation between gross enrolment ratio (GER) in higher education and per capita GDP of nations. This is understandable since higher education has an important role in imparting useful skills, particularly crucial in the knowledge-based modern economy. The gross enrollment ratio (GER) in higher education is very low in most developing countries. According to the UNESCO Institute of Statistics (UIS, 2007), the GER in higher education for India is 13%, China 22%, Brazil 30% and Russia 84%.

In India, about five to seven lakh students graduate in various engineering disciplines, every year. There are about two to three thousand engineering colleges in the country. In recent years, disciplines, such as, Information Technology, Computer Science, Electronics and Communication have become more popular than the traditional engineering disciplines. In order to meet the demand, many private engineering institutions have mushroomed across the country. Most of the institutions offer undergraduate programme in IT/CS and Electronics and Communications. The number of students graduating in these disciplines alone is close to 2.5 lakhs (Kannan and Phatak, 2009).

The biggest resource crunch in the higher technical education is the non-availability of qualified and experienced faculty. The percentage of faculty with doctoral and even masters' degree is at its lowest level today. Further, fresh graduates who join as teachers, are not encouraged to build a long term academic career due to low salaries and poor environment in colleges. To complicate matters further, the higher education system has never geared itself to train or orient the teachers into the art, skill, and pedagogy of teaching, it being assumed that a person with post graduate education and some research credentials will have enough skills and maturity to be a good teacher automatically.

Hence, the quality of education in these colleges is very badly affected.

There are only a handful of colleges in the country, which are perceived as good academic institutions. The engineering students who graduate from these premier institutions would make only about 5% of the total number of engineering graduates in the country. To raise the level of engineering education in the country is a national level problem. There is no one solution to this problem. A possible long-term solution is to create more premier institutions of higher learning. Some of the challenges of building new institutions are huge capital expenditure and finding qualified faculty.

During the past decade, India has made a major impact in the global market because of information technology. We have used ICT to solve problems of other Nations, but we have not exploited our own strength to solve some of our problems. A possible interim solution is to raise the standard of education at all levels through ICT. We feel that for a vast country like India, the most viable solution to impart quality education is to create open source content and distribute it at minimal cost through digital media using latest technologies.

India has got an excellent opportunity to initiate its efforts in re-formulating an education policy. It is important that the existing economic and digital divide needs to be bridged. Implementation and integration of ICT into education system should address some of the issues.

4 ICT enabled teacher training programme at IIT Bombay

4.1 Background

Since 2002, IIT Bombay has been offering courses through Distance Education programme (DEP) using satellite based live and interactive lectures to students/ teachers/ working professionals from multiple remote centres in the country. The Centre for Distance Engineering Education Programme (CDEEP, 2010) now handles all the distance education related activity in IIT Bombay. Currently, there are about seventy (70) EDUSAT centres of Indian Space Research Organization (ISRO) across the country con-

nected to the IIT Bombay network.

In May 2006, IIT Bombay started the eOutreach project (eOutreach, 2010) with the funding from Technology Information, Forecasting and Assessment Council (TIFAC, 2010). It uses the web-based technology for asynchronous dissemination of contents. The audio-visual contents are created through organization of workshops, courses and nutshell lectures and are released in open source for the benefit of students, teachers and professionals. The content created is available for free download from the eOutreach website under the creative commons license (by attribution 2.5).

In 2009, IIT Bombay made a proposal to the Ministry of Human Resource Development (MHRD) under the national mission on education through ICT (NME-ICT, 2010). The proposal on training and engaging a very large number of teachers using EDUSAT to enhance the effectiveness of teaching/learning process was accepted. This initiative envisages a collaborative development of digital teaching/learning material incorporating specific needs of teachers and students as per the syllabi and examination pattern followed at different colleges.

4.2 Objective and Scope

The existing mechanism of enhancing faculty effectiveness through quality improvement programme (QIP) workshops, conducted for twenty to forty teachers at a time, is clearly inadequate, given the large number of engineering colleges in the country. We can reach out to a minuscule percentage of more than 1,50,000 teachers required to be engaged in the education process at this level.

The proposal to train teachers using EDUSAT is unique in scalability. Up to 1000 or more teachers can be involved simultaneously in the exercise. The initiative proposes to conduct around ten workshops on core engineering subjects over a period of three years. The contents of all workshops would be released in open source under 'Creative Commons India' license (Creative-Commons, 2010). The initiative would thus have a significant impact on the engineering education in the country on a very large scale. This methodology has evolved over the years of similar activities at IIT Bombay.

4.3 Training methodology

1. IIT Bombay is the 'hub' for the teacher training workshop. The hub chooses an expert faculty for the subject and if necessary supported by a few additional experts to deal with specific topics. One amongst them is named instructor for the subject.

2. The subject coordinators at each of the remote centres (typically 30) should have taught that subject at least a few times in the local college and should be generally familiar with the syllabus and examination pattern. They are invited to participate in a week long workshop at the hub. Before attending the workshop, they collate and electronically submit the syllabus and question papers of past few years to the instructor at the hub.

3. A week long workshop is conducted to finalize the following: (a) Definition of common syllabus to be covered. (b) Graded coverage from simple to difficult levels for each topic and subtopic. (c) Nature of tutorials and lab sessions, keeping the above gradation and the typical examination pattern in mind, but leading to the typical advanced levels reached in such subject teaching at the top institutions of the world. (d) Discussion of laboratory environment and the experiments to be conducted. (e) Use of the learning management system, audio-visual equipment, editing tools. (f) Other logistic details for conducting the main workshop.

4. In the next two to three months, the instructor completes the content development jointly with other experts, interacting electronically with centre coordinators. The coordinators, in turn, complete the preparations at their centres, setting up the requisite lab environment, gearing up the EDUSAT hub, arranging classroom for lecture/tutorial sessions, etc.

5. The hub publicizes the workshop by sending emails, brochures to various colleges in the country. The teachers are asked to register online to the nearest centre to their colleges.

6. The main two-week workshop is then conducted, with about 1000 participating teachers from these centres. The instructor and the experts at the hub deliver all

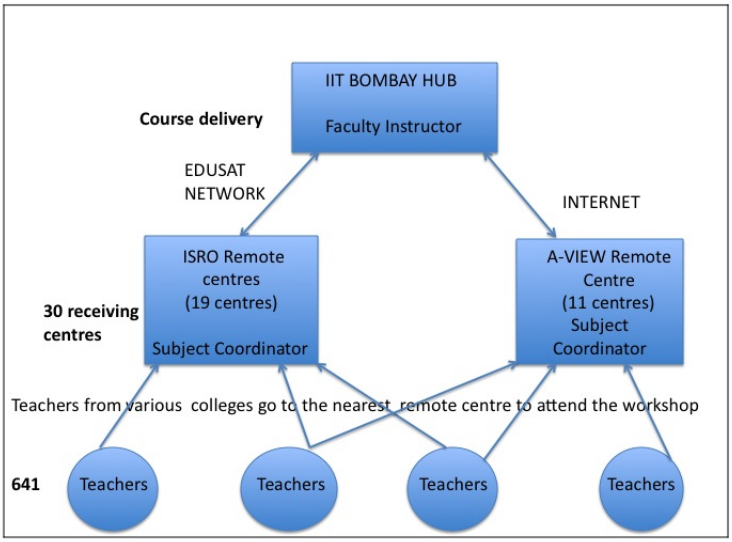

Figure 1: Teacher training workshop using ICT

lectures. Centre coordinators facilitate the interaction during these lectures, and also conduct tutorials labs, and evaluation through quizzes/tests locally, under the general supervision of the experts at the hub.

7. The participating teachers complete the two week portion of the workshop and are assigned work for the remaining two weeks to be carried out at their respective colleges.

8. The centre coordinators interact with the participating teachers at their centre, collect and collate the material and send them through CD to the hub.

9. The instructor supervises the final editing of all contents and releases these in open source. The instructor also certifies the workshop participants jointly with the corresponding centre coordinator. The subject portal is then thrown open for access and participation by all interested students and teachers across the country.

5 Data, Methodology used and Analysis

5.1 Teacher training workshop

The pilot workshop to test the feasibility of teacher training in the distance mode was conducted in December 2009. After the success of the pilot, the first teacher training workshop through distance mode was conducted in July 2010. Figure 1 explains the process used to train a very large number of teachers. The subject chosen for the workshop was 'Effective teaching and learning of Computer Programming'. This course is being taught in all engineering colleges and Master in Computer Application (MCA) programme in the country. About seven lakh students study this subject every year, taught by about ten thousand teachers, typically in the first year of all branches of engineering and MCA.

A total of six hundred and forty one (641) faculty members from two hundred and eighteen (218) engineering colleges across the country attended the workshop in a distance mode. The lectures were transmitted live through the EDUSAT network and Internet (through e-learning software 'A-View') to thirty (30) remote centres. Learning management system, such as MOODLE was used for assignments, laboratory sessions, interaction and feedback. Table 1 gives the statistics on the workshop.

The morning sessions were devoted totally to lectures and presentations. In the afternoon sessions, the participants worked on assignments in a computer laboratory in the remote centers. The laboratory sessions were held to ensure that the participants had a firm grasp on the subject. All the material used in the workshop would be freely available in open source. In all, the participants underwent nearly forty hours of lectures and twenty-four hours of laboratory assignments.

In addition to the subject, the participants were made familiar with a technology known as a clicker technology: the locally designed audio response systems, 'clickers' were used in the workshop. They are an effective means to know whether the participants have understood the topic being taught. Instant analysis of the participants' response from various centres are displayed on the screen at the hub through Internet. The participants' responses can also be stored to enable analysis after the lecture. The laboratory sessions also covered the freeware learning management system, MOODLE, which is very effective

Table 1: Workshop statistics

Participation in the workshop	Total number
Teachers participated	641
Engineering colleges	218
Cities and towns	130
States represented	13
Receiving centres (EDUSAT and INTERNET)	30

Table 2: State-wise distribution of participants

State	No. of remote centres	Participants	
		No.	%
Andhra Pradesh	1	38	5.93
Gujarat	2	32	4.99
Haryana	1	30	4.68
Jammu and Kashmir	1	19	2.96
Karnataka	2	27	4.21
Kerala	3	57	8.89
Madhya Pradesh	2	43	6.71
Maharashtra	8	145	22.62
Punjab	1	13	2.03
Rajasthan	1	16	2.50
Tamil Nadu	6	191	29.80
Uttar Pradesh	1	17	2.65
West Bengal	1	13	2.03
TOTAL	30	641	100

in facilitating interaction amongst students and teachers.

5.2 Observation, Survey and Feedback

5.2.1 Observation

1. A two-week pilot workshop to test the feasibility of conducting a large-scale teacher training workshop was conducted in December 2009. About six hundred and thirty teachers participated in the pilot workshop in twenty two centres. During the pilot workshop, there were initial complaints from few centres about the quality of audio and video. This was later sorted out by the technical team of ISRO.

2. The main workshop was conducted in July 2010. Six hundred and forty one teachers from two hundred and eighteen colleges participated in the workshop. Apart from EDUSAT technology, Internet was also used to transmit the lectures live to the centres. Therefore, few more centres could participate in the main workshop.

3. During the main workshop the audio and video quality of lectures delivered through EDUSAT and Internet was very good and was quite effective. The coordinators of the centres had gained experience through the pilot and were able to solve some of the technical problems at their centres.

4. As the number of engineering colleges are higher in the states of Tamil Nadu and Maharashtra, maximum participation were from these two states, 29.80% and 22.62% respectively. Table 2 gives the statewise distribution of participants.

5. The participants asked numerous questions either directly or through the chat sessions. The quality of questions showed sufficient understanding of the subject.

6. The center coordinators did an excellent job in ensuring good infrastructure at their respective remote centres and in overall coordination during the workshop.

7. The technical and administrative support needed to successful delivery of course across multiple centres was quite significant. The support team at IIT Bombay worked around the clock to handle queries related to MOODLE, clicker, assignments, as they arose. ISRO and CDEEP gave the required technical support.

5.2.2 Survey

After the main workshop in July 2010, the participants were asked to fill online survey form. Out of 641 participants, 448 responded to the survey. 49.55% (222) respondents were females and 50.45% (226) respondents were males. 68% of the respondents were in the age group 23-30 years, 26% were in the age group 31-40 years and the remaining 6% were above 41 years.

According to the survey, about 95% of the participants agreed that the primary reason for joining the workshop was to learn new teaching methods from IIT faculty.

Table 3: Reasons for joining the workshop

Reasons	Agreed
To learn new teaching methodology from IIT teachers	95%
To experience distance mode teaching	80%
To interact with other college teachers	78%
To get certification	55%
To get IIT brand name	53%
To reduce preparation time for the lectures	51%

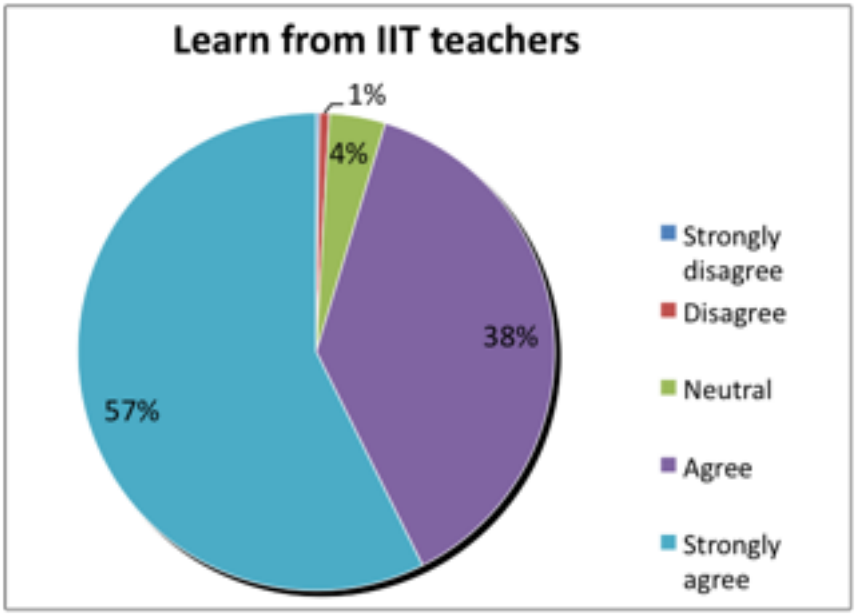

Figure 2: Reasons: To learn new teaching methodology from IIT teachers

Table 3 and Figures 2 to 7 gives the details on various reasons for joining the workshop.

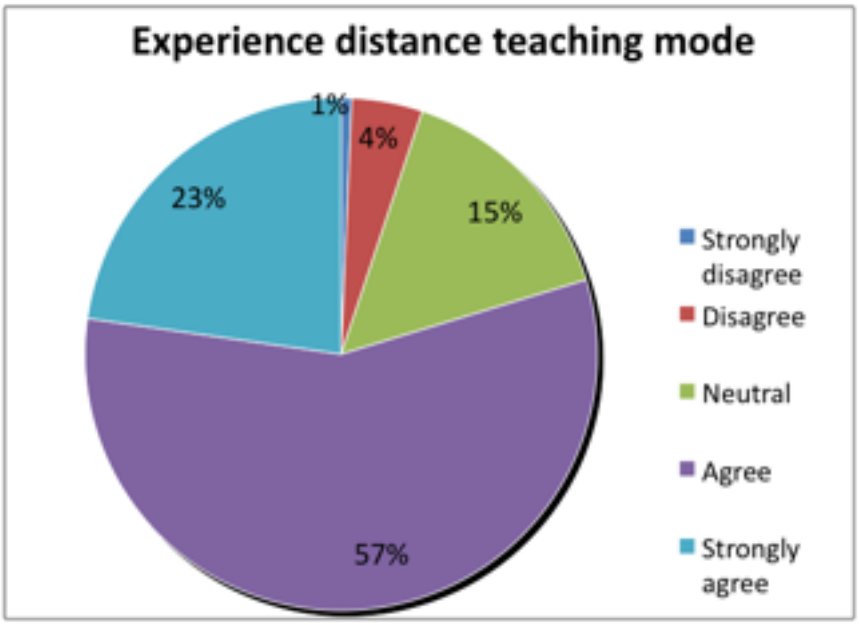

Figure 3: Reasons: To experience distance mode teaching

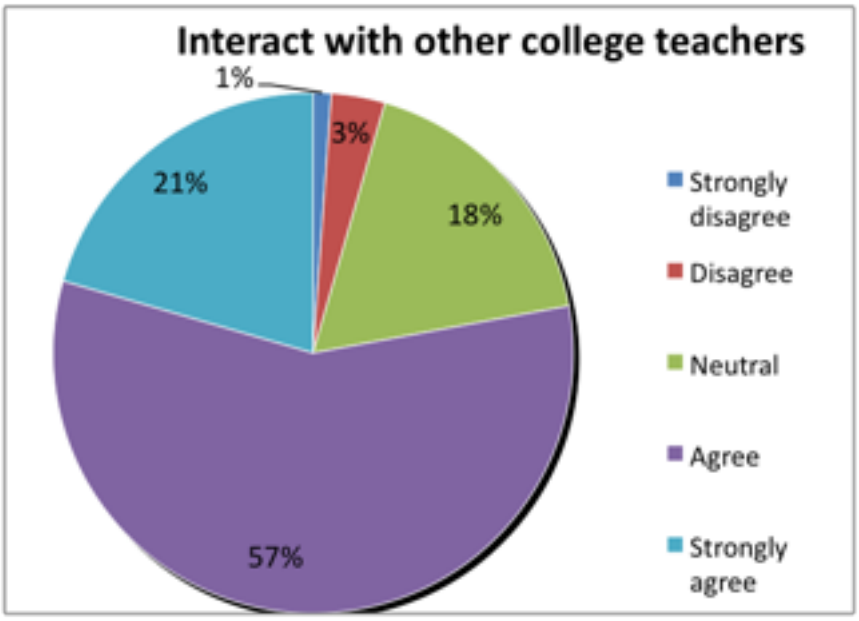

Figure 4: Reasons: To interact with other college teachers

5.2.3 Feedback

The survey captured the feedback from the participants on adoption of teaching material, teaching methodology and their experience of the workshop.

On an average about 90% of the respondents agreed that they were likely to adopt lecture material, group work, laboratory material and assignments in their teaching.

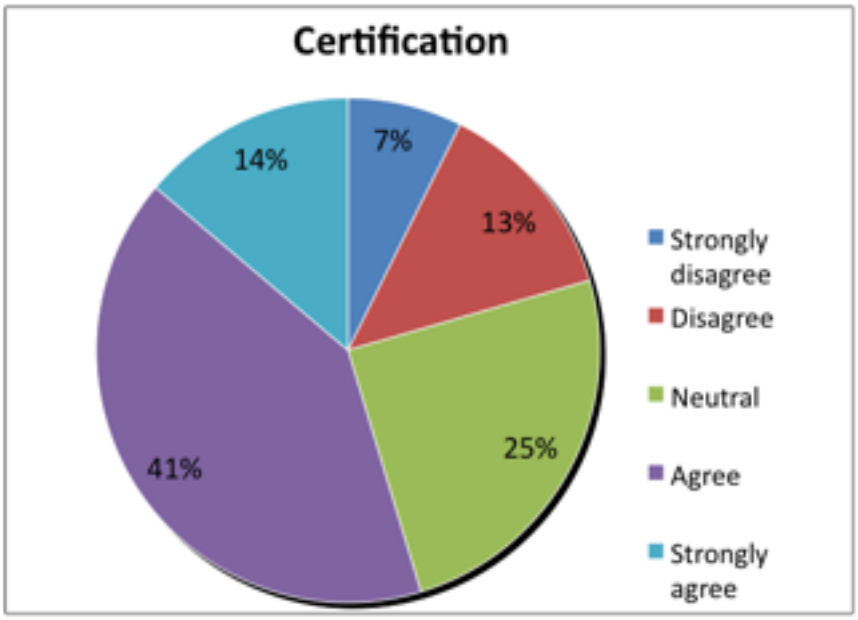

Figure 5: Reasons: Certification

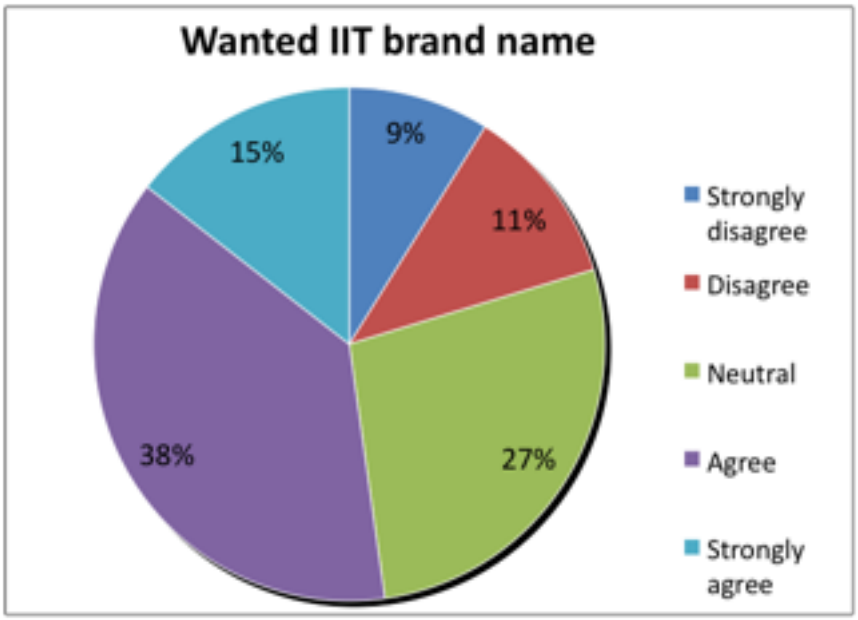

Figure 6: Reasons: Want IIT brand name

On a five point scale the participants were asked to give their feedback on meeting the workshop objectives. The responses were very positive, the details are given in Table 4.

- 46% of the respondents rated lectures as the most favourite part of the workshop. The detailed statistics is shown in Figure 8.

- 93% of the respondents said that during this workshop they were first time intro-

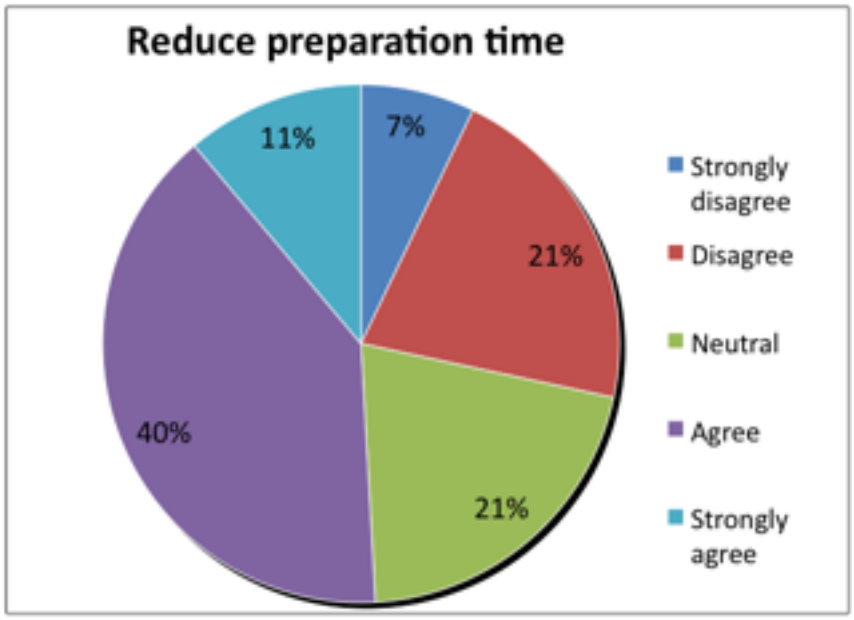

Figure 7: Reasons: To reduce preparation time

Table 4: Feedback: Meeting the workshop objectives

Objective	SA	A	N	D	SD
Workshop improved the understanding of the subject	36%	56%	7%	1%	-
Would enable to teach better	34%	61%	4%	1%	-
More workshops on other topics should be conducted	64%	34%	2%	-	-
Course material provided sufficient examples and teaching tools	25%	66%	8%	1%	- -

(SA- Strongly agree, A- Agree, N- Neutral, D- Disagree, SD- Strongly disagree)

duced to new teaching aids and technology, such as MOODLE and clicker.

- 95% of the respondents said that the overall experience of the workshop was good or excellent, of these 43% said it was excellent. Figure 9 shows the overall experience.

5.3 Discussion

This workshop was first of its kind where a large number of college teachers were engaged simultaneously through the EDUSAT network and Internet. To test the feasibility

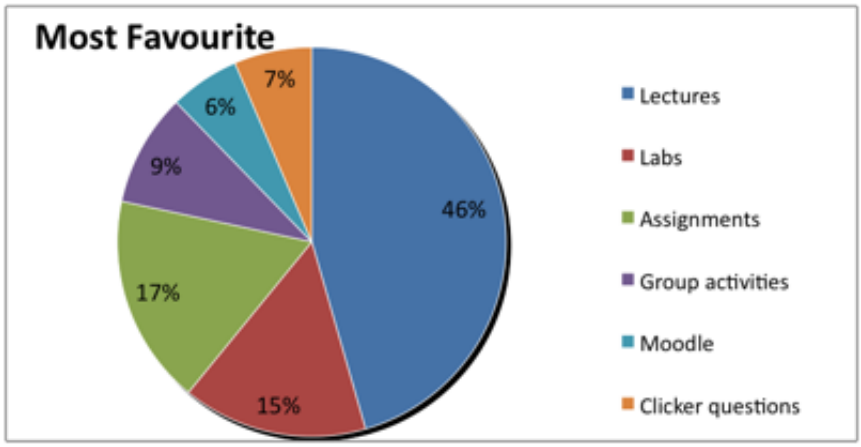

Figure 8: Feedback: Most favourite part of the workshop

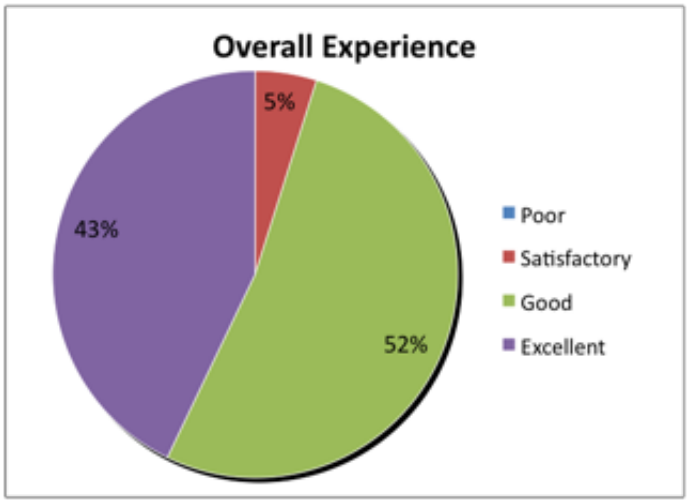

Figure 9: Feedback: Overall experience of the workshop

of conducting a large-scale teacher training workshop, a two-week pilot workshop was conducted in December 2009. The pilot workshop helped both the organizing team and the remote centres to sort out problems at their respective centres.

As the remote centres were located in over 30 different cities, the centre coordinators from each centre played a very important role. They were invited to spend around a week in IIT Bombay to understand the process of the workshop, new teaching tools like clickers, MOODLE and various open source software. Due to the experience gained in the pilot workshop, the centre coordinators were more confident to handle queries and technical problems at their centres during the main workshop.

The registration of the participants were handled online. It was found that both

during the pilot phase and during the main workshop the number of registrations were about 1000, but the dropout rate was high around 35%. Hence, the coordinators found it difficult to plan the workshop logistics for the participating teachers. In future workshops, some mechanism to reduce the dropout rate has to be worked out.

There were few technical problems. Some centres faced low audio-video quality during the pilot. The technical team of ISRO sorted it out by upgrading the system for better reception. As the clickers were new to most of the participants, they were not very comfortable in using them initially. Lack of trained manpower at the remote centres was one of the reasons that contributed to the inability to understand instructions and manuals provided with the system. During the pilot phase the clicker team personally visited the centres and explained the process of using clickers. As a result, during the main workshop people were more comfortable in using the clickers. The feedback from the participants show that teachers could consider using the clicker technology as an effective tool in the teaching-learning process.

The two-way live interaction with the remote centres made the sessions interactive and interesting. The participants found it easy to raise queries during the sessions. IIT Bombay provided workshop support in the form of chat sessions, phone calls, group emails to solve any problem during the workshop. The lessons learned from this workshop would be useful for conducting future workshops in the distance mode.

Further research is required to assess the impact of such large scale teacher training programme on the quality of engineering education in the country. Some of the questions which can be answered through research are:

Is the training programme able to reach out to the student community (the target group)? Whether the socio-economic background of the participants has any significance in the perception of such training programmes? Who are more likely to adopt the material in their teaching, people teaching in urban areas or rural? How the training programme can be modified for better acceptance in the teaching community?

6 Summary and Conclusion

Education has evolved over the years from the basic reading, writing and arithmetic, to present day globalized view, which stresses on group work, lateral thinking, creativity, problem solving and innovation. The education system faces many new challenges. Some of the challenges, such as expanding the reach of education, imparting quality education at affordable costs and shortage of qualified and experienced faculty cannot be solved by the traditional system of education. We need a new approach to address these challenges. Implementation and integration of information and communication technologies (ICT) into education system should address some of the challenges. Through the application of ICT, one can diminish the impact of space, time and distance. In the last two decades, many institutions around the world have adopted ICT enabled education to close the gap between old and new models of teaching/learning. ICT gives rise to new digital skills and competence that are needed for employment, education and training, self development and participation in the society.

Learning in future will focus on the digital devices that expedite access to information and the way learners share and learn. With the advent of ICT in education, future education will be affordable to all sections of the society. It is predicted that in future, virtual universities will become real and many virtual universities will emerge in the developing countries, as it will be cost effective and can cater to a large population. Many problems of the developing world, such as poverty, illiteracy and inequality can be addressed with the help of ICT enabled education. Future education will mix the best features of both conventional and digital world in creating a *knowledge rich society.*

In this paper we discussed the concept and methodology involved in training a large number of teachers in synchronous distance mode and examined the usefulness or impact of such initiatives on the teaching communities in India. Both satellite (EDUSAT) and Internet technology were used to reach out to a large number of college teachers through 30 remote centres in the country. 641 teachers from 218 engineering colleges participated in the training programme. The teachers were from 130 different cities and towns in the country. With the help of ICT enabled teacher training we could reach out to teachers located in the less developed regions in the country, which would have been otherwise

difficult. From the survey, we found that about 95% of the teachers joined the programme to learn new teaching methods from IIT faculty. On an average about 90% of the teachers agreed that they were likely to adopt the teaching material and methodology in their teaching. During the programme, about 93% of the teachers were first time introduced to new teaching aids and technology. This shows that even though the technology is available it is not being widely used in teaching. We believe that through the ICT enabled training programme, teachers would get greater exposure to technology, new teaching aids and better knowledge. Effective use of ICT for teacher training can scale up the training activity significantly in the country and help in human capital formation. Such initiatives would not only help improve the quality of higher education, but also facilitate appropriate use of demographic dividend that India is going to possess soon.

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